

Claims:

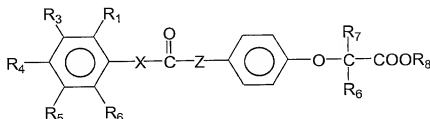
1. A method for measuring a blood oxygen level-dependent magnetic resonance imaging signal, comprising

a) administering an effective amount of an allosteric effector compound capable of decreasing hemoglobin binding affinity for oxygen; and

b) performing a blood oxygen level-dependent magnetic resonance imaging scan, whereby said blood oxygen level-dependent magnetic resonance imaging signal is measured.

2. The method of Claim 1, wherein the allosteric effector compound is selected from the group consisting of:

a compound having the formula:

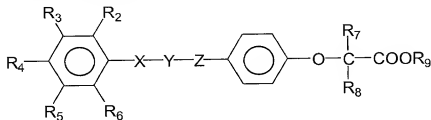


where R₁₋₅ may be hydrogen, halogen, or a substituted or unsubstituted C₁₋₃ alkyl group and may be the same or different,

R₆₋₇ may each be hydrogen or methyl and may be the same or different, and

R₈ may be hydrogen, a substituted or unsubstituted C₁₋₃ alkyl group, or a salt cation, and X and Z are CH₂, NH, or O;

a compound having the formula:



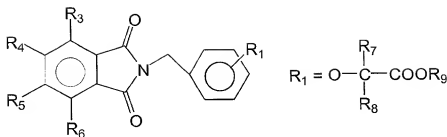
where X and Z may each be CH₂, CO, NH or O, and Y may be CO or NH, which the caveat that X, Y, and Z must all be different from each other, and

R₂₋₆ can be the hydrogen, halogen, substituted or unsubstituted C₁₋₃ alkyl groups, and may be the same or different,

R₇₋₈ can be hydrogens, methyls, ethyls, or alkyl groups in a ring connecting the two, and

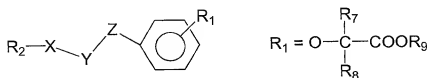
R₉ can be a hydrogen, lower alkyl, or salt cation;

a compound having the formula:



where R_{3-6} can be the hydrogen, halogen, substituted or unsubstituted C_{1-3} alkyl group, or a C_{1-3} ether or ester, and these moieties may be the same or different, or alkyl moieties of an aromatic or aliphatic ring incorporating two of the R_{3-6} ,

R_1 can be connected to any position on the phenyl ring, and sites R_{7-8} can be hydrogen, halogen, methyl, ethyl, and these moieties may be the same or different, or alkyl groups in a ring connecting the two, and R_9 can be a hydrogen, halogen, C_{1-3} lower alkyl, or salt cation; a compound having the formula:



where R_1 can be connected to any position on the phenyl ring, and sites R_{7-8} can be hydrogen, halogen, methyl, ethyl, and these moieties may be the same or different, or alkyl groups in a ring connecting the two, and

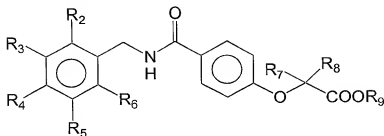
R_2 is defined as a substituted or unsubstituted aromatic compound, a substituted or unsubstituted alkyl ring compound, or a substituted or unsubstituted phthalimide compound,

X is a carboxyl,

Y is a nitrogen,

and R_2 completes the phthalimide compound by being bonded to both X and Y; and where X, Y, and Z, may either be CH_2 , NH, O, or N, with the caveat that each are different from the other;

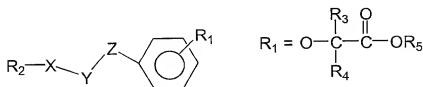
a compound having the formula:



where R₂, R₃, R₄, R₅, and R₆ may be hydrogen, halogen, or alkyl groups and may be the same or different,

R₇ and R₈ may be hydrogen or methyl groups and may be the same or different, and where the R₉ moiety is hydrogen or a salt cation;

a compound having the formula:



where R₂ is a substituted or unsubstituted aromatic compound, or a substituted or unsubstituted alkyl ring compound, or a substituted or unsubstituted phthalimide compound that incorporates X and Y,

X is a carbonyl,

Y is a nitrogen, and

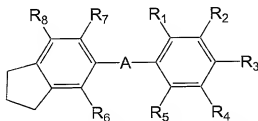
R₂ completes the phthalimide compound by being bonded to both X and Y, and where X, Y, and Z are CH₂, NH, S, SO₂, CO, O or N with the caveat that X, Y, and Z are each different from one another, and

where R₁ can be connected to any position on the phenyl ring, and

R₃ and R₄ are hydrogen, halogen, methyl, ethyl, propyl, isopropyl, neopentyl, butyl, or substituted or unsubstituted aryl groups and these moieties may be the same or different, or alkyl moieties as part of an aliphatic ring connecting R₃ and R₄, and

R₅ is a hydrogen, halogen, C₁₋₃ lower alkyl, or a salt cation;

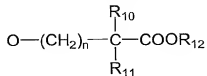
a compound having the formula:



where A is a chemical bridge which includes two to four chemical moieties bonded together,

the chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₉ where R₉ is a C₁₋₆ alkyl group, CH₂, CH, and C, with the proviso that, except in the case where A contains two identical CH and C moieties positioned adjacent one another to form an alkene or alkyne, the chemical moieties in A are each different from one another, and

at least one of R₁₋₅ is substituted with a compound having the chemical formula:



where n is zero to five,

where R₁₀ and R₁₁ are selected from the group consisting of hydrogen, halogen, C₁₋₁₂

alkyl groups, carboxylic acids and esters, aromatic or heteroatomic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₁₀ and R₁₁, and where R₁₂ is a hydrogen, halogen, salt cation, metal, or C₁₋₆ alkyl group, and wherein a remainder of the R₁₋₅ moieties and the R₆₋₈ moieties are selected from the group consisting of hydrogen, halogen, C₁₋₆ alkyl groups, C₁₋₆ ether or esters, aromatics and heteroaromatics, and alkyl moieties of an aliphatic ring connecting two sites on a phenyl group; a compound having the formula:



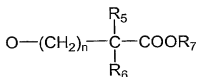
where R₁ and R₂ each are a substituted or unsubstituted aromatic or heteroaromatic compounds, or a substituted or unsubstituted alkyl or heteroalkyl ring compound, or a substituted or unsubstituted phthalimide compound, and

where R₁ and R₂ may be the same or different,

where A is a chemical bridge which includes three chemical moieties bonded together between R₁ and R₂,

wherein the chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₃ where R₃ is C₁₋₆ alkyl group, NR₄ where R₄ includes two carbonyls as part of a phthalimide compound formed with R₁ or R₂, CH₂, CH, and C, and

where at least one of R₁ and R₂ is substituted with a compounds having the chemical formula:



where n is zero to five, where R₅ and R₆ are selected from the group consisting of hydrogen, halogen, substituted or unsubstituted C₁₋₁₂ alkyl groups, carboxylic acid and ester groups, substituted or unsubstituted aromatic or heteroaromatic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₅ and R₆, and

where R₇ is a hydrogen, halogen, salt cation, metal, or substituted or unsubstituted C₁₋₆ alkyl group;

a compound having the formula:



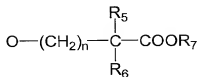
where R₁ and R₂ each are a substituted or unsubstituted aromatic or heteroaromatic compound, or substituted or unsubstituted alkyl or heteroalkyl ring compound, or a substituted or unsubstituted phthalimide compound, and

where R₁ and R₂ may be the same or different,

where A is a chemical bridge which includes two to four chemical moieties bonded together between R₁ and R₂,

wherein said chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₃ where R₃ is a C₁₋₆ alkyl group, NR₄ where R₄ includes two carbonyls as part of a phthalimide compound formed with R₁ or R₂, CH₂, CH, and C, with the caveat that, except in the case where A contains two identical CH and C moieties positioned adjacent one another to form an alkene or alkyne, the chemical moieties in A are each different from one another, and

wherein at least one of R₁ or R₂ is substituted with a compound having the chemical formula:

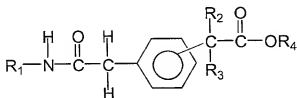


where n is zero to five,

where R₅ and R₆ are selected from the group consisting of hydrogen, halogen, substituted or unsubstituted C₁₋₁₂ alkyl groups, carboxylic acid and ester, substituted or unsubstituted aromatic or heteroaromatic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₅ and R₆, and

where R₇ is a hydrogen, halogen, salt cation, metal, or substituted or unsubstituted C₁₋₆ alkyl group; and

a compound having the formula:



where R₁ is selected from the group consisting of optionally substituted phenyl, adamantyl, naphthyl, and indanyl, R_{2,3} are alkyl moieties of a C₃₋₆ alkyl ring connecting R₂ and R₃, and R₄ is a hydrogen, a monovalent salt cation, or a C₁₋₃ lower alkyl.

3. The method of Claim 2, wherein the allosteric effector compound is administered at a dose of 100-300 mg/kg.

4. The method of Claim 1, wherein the allosteric effector compound is 2-[4-(((3,5-dimethylanilino)carbonyl)methyl)phenoxy]-2-methylpropionic acid, or a physiologically acceptable salt thereof.

5. The method of Claim 4, wherein the allosteric effector compound is administered at a dose of 100-300 mg/kg.

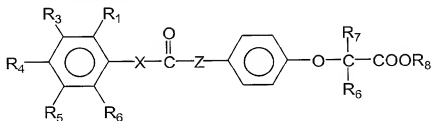
6. The method of Claim 4, wherein the allosteric effector compound is administered at a dose of 200 mg/kg.

7. A method of increasing the sensitivity of cells to the cytotoxic effects of ionizing radiation comprising:

- a) contacting the cells with an amount of a compound effective to oxygenate the cells;
- b) measuring the oxygenation of the cells; and
- c) administering an effective cytotoxic dose of ionizing radiation to the cells.

8. The method of Claim 7, wherein the allosteric effector compound is selected from the group consisting of:

a compound having the formula:

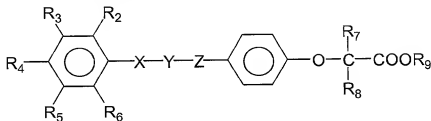


where R₁₋₅ may be hydrogen, halogen, or a substituted or unsubstituted C₁₋₃ alkyl group and may be the same or different,

R₆₋₇ may each be hydrogen or methyl and may be the same or different, and

R_8 may be hydrogen, a substituted or unsubstituted C_{1-3} alkyl group, or a salt cation, and
X and Z are CH_2 , NH, or O;

a compound having the formula:



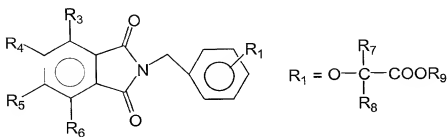
where X and Z may each be CH_2 , CO, NH or O, and Y may be CO or NH, which the
caveat that X, Y, and Z must all be different from each other, and

R_{2-6} can be the hydrogen, halogen, substituted or unsubstituted C_{1-3} alkyl groups, and may
be the same or different,

R_{7-8} can be hydrogens, methyls, ethyls, or alkyl groups in a ring connecting the two, and

R_9 can be a hydrogen, lower alkyl, or salt cation;

a compound having the formula:



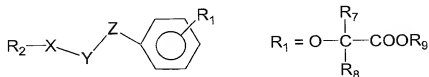
where R_{3-6} can be the hydrogen, halogen, substituted or unsubstituted C_{1-3} alkyl group, or
a C_{1-3} ether or ester, and these moieties may be the same or different, or alkyl moieties of an
aromatic or aliphatic ring incorporating two of the R_{3-6} ,

R_1 can be connected to any position on the phenyl ring, and

sites R_{7-8} can be hydrogen, halogen, methyl, ethyl, and these moieties may be the same or
different, or alkyl groups in a ring connecting the two, and

R_9 can be a hydrogen, halogen, C_{1-3} lower alkyl, or salt cation;

a compound having the formula:



where R_1 can be connected to any position on the phenyl ring, and

sites $R_{7,8}$ can be hydrogen, halogen, methyl, ethyl, and these moieties may be the same or different, or alkyl groups in a ring connecting the two, and

R_2 is defined as a substituted or unsubstituted aromatic compound, a substituted or unsubstituted alkyl ring compound, or a substituted or unsubstituted phthalimide compound,

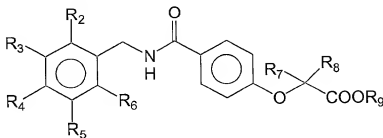
X is a carboxyl,

Y is a nitrogen,

and R_2 completes the phthalimide compound by being bonded to both X and Y; and

where X, Y, and Z, may either be CH_2 , NH, O, or N, with the caveat that each are different from the other;

a compound having the formula:

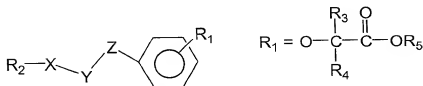


where R_2 , R_3 , R_4 , R_5 , and R_6 may be hydrogen, halogen, or alkyl groups and may be the same or different,

R_7 and R_8 may be hydrogen or methyl groups and may be the same or different, and

where the R_9 moiety is hydrogen or a salt cation;

a compound having the formula:



where R_2 is a substituted or unsubstituted aromatic compound, or a substituted or unsubstituted alkyl ring compound, or a substituted or unsubstituted phthalimide compound that incorporates X and Y,

X is a carbonyl,

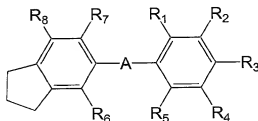
Y is a nitrogen, and

R_2 completes the phthalimide compound by being bonded to both X and Y, and where X, Y, and Z are CH_2 , NH, S, SO_2 , CO, O or N with the caveat that X, Y, and Z are each different from one another, and

where R_1 can be connected to any position on the phenyl ring, and

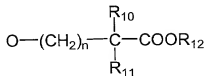
R₃ and R₄ are hydrogen, halogen, methyl, ethyl, propyl, isopropyl, neopentyl, butyl, or substituted or unsubstituted aryl groups and these moieties may be the same or different, or alkyl moieties as part of an aliphatic ring connecting R₃ and R₄, and

R₅ is a hydrogen, halogen, C₁₋₃ lower alkyl, or a salt cation;
a compound having the formula:



where A is a chemical bridge which includes two to four chemical moieties bonded together,

the chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₉ where R₉ is a C₁₋₆ alkyl group, CH₂, CH, and C, with the proviso that, except in the case where A contains two identical CH and C moieties positioned adjacent one another to form an alkene or alkyne, the chemical moieties in A are each different from one another, and at least one of R₁₋₅ is substituted with a compound having the chemical formula:



where n is zero to five,

where R₁₀ and R₁₁ are selected from the group consisting of hydrogen, halogen, C₁₋₁₂ alkyl groups, carboxylic acids and esters, aromatic or heteroatomic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₁₀ and R₁₁, and where R₁₂ is a hydrogen, halogen, salt cation, metal, or C₁₋₆ alkyl group, and wherein a remainder of the R₁₋₅ moieties and the R₆₋₈ moieties are selected from the group consisting of hydrogen, halogen, C₁₋₆ alkyl groups, C₁₋₆ ether or esters, aromatics and heteroaromatics, and alkyl moieties of an aliphatic ring connecting two sites on a phenyl group;
a compound having the formula:



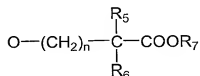
where R₁ and R₂ each are a substituted or unsubstituted aromatic or heteroaromatic compounds, or a substituted or unsubstituted alkyl or heteroalkyl ring compound, or a substituted or unsubstituted phthalimide compound, and

where R₁ and R₂ may be the same or different,

where A is a chemical bridge which includes three chemical moieties bonded together between R₁ and R₂,

wherein the chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₃ where R₃ is C₁₋₆ alkyl group, NR₄ where R₄ includes two carbonyls as part of a phthalimide compound formed with R₁ or R₂, CH₂, CH, and C, and

where at least one of R₁ and R₂ is substituted with a compounds having the chemical formula:



where n is zero to five, where R₅ and R₆ are selected from the group consisting of hydrogen, halogen, substituted or unsubstituted C₁₋₁₂ alkyl groups, carboxylic acid and ester groups, substituted or unsubstituted aromatic or heteroaromatic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₅ and R₆, and

where R₇ is a hydrogen, halogen, salt cation, metal, or substituted or unsubstituted C₁₋₆ alkyl group;

a compound having the formula:



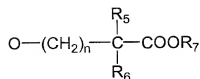
where R₁ and R₂ each are a substituted or unsubstituted aromatic or heteroaromatic compound, or substituted or unsubstituted alkyl or heteroalkyl ring compound, or a substituted or unsubstituted phthalimide compound, and

where R₁ and R₂ may be the same or different,

where A is a chemical bridge which includes two to four chemical moieties bonded together between R₁ and R₂,

wherein said chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₃ where R₃ is a C₁₋₆ alkyl group, NR₄ where R₄ includes two carbonyls as part of a phthalimide compound formed with R₁ or R₂, CH₂, CH, and C, with the caveat that, except in the case where A contains two identical CH and C moieties positioned adjacent one another to form an alkene or alkyne, the chemical moieties in A are each different from one another, and

wherein at least one of R₁ or R₂ is substituted with a compound having the chemical formula:

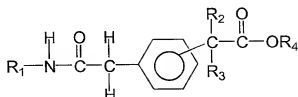


where n is zero to five,

where R₅ and R₆ are selected from the group consisting of hydrogen, halogen, substituted or unsubstituted C₁₋₁₂ alkyl groups, carboxylic acid and ester, substituted or unsubstituted aromatic or heteroaromatic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₅ and R₆, and

where R₇ is a hydrogen, halogen, salt cation, metal, or substituted or unsubstituted C₁₋₆ alkyl group; and

a compound having the formula:



where R₁ is selected from the group consisting of optionally substituted phenyl, adamantyl, naphthyl, and indanyl, R₂₋₃ are alkyl moieties of a C₃₋₆ alkyl ring connecting R₂ and R₃, and R₄ is a hydrogen, a monovalent salt cation, or a C₁₋₃ lower alkyl.

9. The method of Claim 8, wherein the allosteric effector compound is administered at a dose of 100-300 mg/kg.

10. The method of Claim 7, wherein the allosteric effector compound is 2-[4-(((3,5-dimethylanilino)carbonyl)methyl)phenoxy]-2-methylpropionic acid, or a physiologically acceptable salt thereof.

11. The method of Claim 10, wherein the allosteric effector compound is administered at a dose of 100-300 mg/kg.

12. The method of Claim 10, wherein the allosteric effector compound is administered at a dose of 200 mg/kg.

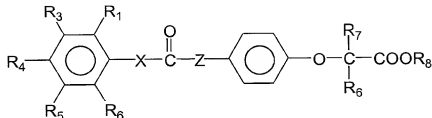
13. A method of measuring tumor oxygenation, comprising

- a) administering an effective amount of an allosteric effector compound capable of decreasing hemoglobin binding affinity for oxygen; and
- b) performing a blood oxygen level-dependent magnetic resonance imaging scan, whereby oxygenation of the tumor is measured.

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14. The method of Claim 13, wherein the allosteric effector compound is selected from the group consisting of:

a compound having the formula:

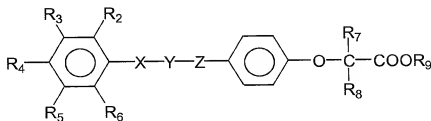


where R_{1-5} may be hydrogen, halogen, or a substituted or unsubstituted C_{1-3} alkyl group and may be the same or different,

R_{6-7} may each be hydrogen or methyl and may be the same or different, and

R_8 may be hydrogen, a substituted or unsubstituted C_{1-3} alkyl group, or a salt cation, and X and Z are CH_2 , NH, or O;

a compound having the formula:

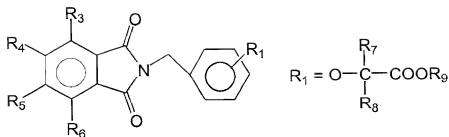


where X and Z may each be CH_2 , CO, NH or O, and Y may be CO or NH, which the caveat that X, Y, and Z must all be different from each other, and

R_{2-6} can be the hydrogen, halogen, substituted or unsubstituted C_{1-3} alkyl groups, and may be the same or different,

R_{7-8} can be hydrogens, methyls, ethyls, or alkyl groups in a ring connecting the two, and R_9 can be a hydrogen, lower alkyl, or salt cation;

a compound having the formula:

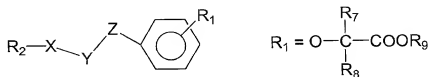


where R_{3-6} can be the hydrogen, halogen, substituted or unsubstituted C_{1-3} alkyl group, or a C_{1-3} ether or ester, and these moieties may be the same or different, or alkyl moieties of an aromatic or aliphatic ring incorporating two of the R_{3-6} ,

R_1 can be connected to any position on the phenyl ring, and sites $R_{7,8}$ can be hydrogen, halogen, methyl, ethyl, and these moieties may be the same or different, or alkyl groups in a ring connecting the two, and

R_9 can be a hydrogen, halogen, C_{1-3} lower alkyl, or salt cation;

a compound having the formula:



where R_1 can be connected to any position on the phenyl ring, and sites $R_{7,8}$ can be hydrogen, halogen, methyl, ethyl, and these moieties may be the same or different, or alkyl groups in a ring connecting the two, and

R_2 is defined as a substituted or unsubstituted aromatic compound, a substituted or unsubstituted alkyl ring compound, or a substituted or unsubstituted phthalimide compound,

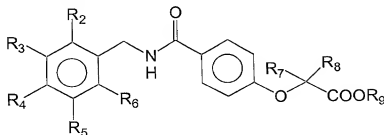
X is a carboxyl,

Y is a nitrogen,

and R_2 completes the phthalimide compound by being bonded to both X and Y ; and

where X , Y , and Z , may either be CH_2 , NH , O , or N , with the caveat that each are different from the other;

a compound having the formula:

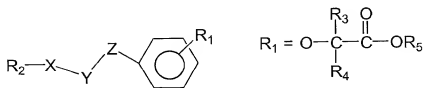


where R₂, R₃, R₄, R₅, and R₆ may be hydrogen, halogen, or alkyl groups and may be the same or different,

R₇ and R₈ may be hydrogen or methyl groups and may be the same or different, and

where the R₉ moiety is hydrogen or a salt cation;

a compound having the formula:



where R₂ is a substituted or unsubstituted aromatic compound, or a substituted or unsubstituted alkyl ring compound, or a substituted or unsubstituted phthalimide compound that incorporates X and Y,

X is a carbonyl,

Y is a nitrogen, and

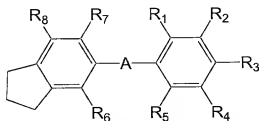
R₂ completes the phthalimide compound by being bonded to both X and Y, and where X, Y, and Z are CH₂, NH, S, SO₂, CO, O or N with the caveat that X, Y, and Z are each different from one another, and

where R₁ can be connected to any position on the phenyl ring, and

R₃ and R₄ are hydrogen, halogen, methyl, ethyl, propyl, isopropyl, neopentyl, butyl, or substituted or unsubstituted aryl groups and these moieties may be the same or different, or alkyl moieties as part of an aliphatic ring connecting R₃ and R₄, and

R₅ is a hydrogen, halogen, C₁₋₃ lower alkyl, or a salt cation;

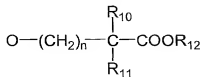
a compound having the formula:



where A is a chemical bridge which includes two to four chemical moieties bonded together,

the chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₉ where R₉ is a C₁₋₆ alkyl group, CH₂, CH, and C, with the proviso that, except in the case where A contains two identical CH and C moieties positioned adjacent one another to form an alkene or alkyne, the chemical moieties in A are each different from one another, and

at least one of R₁₋₅ is substituted with a compound having the chemical formula:



where n is zero to five,

where R₁₀ and R₁₁ are selected from the group consisting of hydrogen, halogen, C₁₋₁₂ alkyl groups, carboxylic acids and esters, aromatic or heteroatomic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₁₀ and R₁₁, and where R₁₂ is a hydrogen, halogen, salt cation, metal, or C₁₋₆ alkyl group, and wherein a remainder of the R₁₋₅ moieties and the R₆₋₈ moieties are selected from the group consisting of hydrogen, halogen, C₁₋₆ alkyl groups, C₁₋₆ ether or esters, aromatics and heteroaromatics, and alkyl moieties of an aliphatic ring connecting two sites on a phenyl group; a compound having the formula:



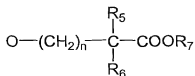
where R₁ and R₂ each are a substituted or unsubstituted aromatic or heteroaromatic compounds, or a substituted or unsubstituted alkyl or heteroalkyl ring compound, or a substituted or unsubstituted phthalimide compound, and

where R₁ and R₂ may be the same or different,

where A is a chemical bridge which includes three chemical moieties bonded together between R₁ and R₂,

wherein the chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₃ where R₃ is C₁₋₆ alkyl group, NR₄ where R₄ includes two carbonyls as part of a phthalimide compound formed with R₁ or R₂, CH₂, CH, and C, and

where at least one of R₁ and R₂ is substituted with a compounds having the chemical formula:



where n is zero to five, where R₅ and R₆ are selected from the group consisting of hydrogen, halogen, substituted or unsubstituted C₁₋₁₂ alkyl groups, carboxylic acid and ester groups, substituted or unsubstituted aromatic or heteroaromatic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₅ and R₆, and

where R₇ is a hydrogen, halogen, salt cation, metal, or substituted or unsubstituted C₁₋₆ alkyl group;

a compound having the formula:



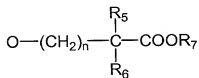
where R₁ and R₂ each are a substituted or unsubstituted aromatic or heteroaromatic compound, or substituted or unsubstituted alkyl or heteroalkyl ring compound, or a substituted or unsubstituted phthalimide compound, and

where R₁ and R₂ may be the same or different,

where A is a chemical bridge which includes two to four chemical moieties bonded together between R₁ and R₂,

wherein said chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₃ where R₃ is a C₁₋₆ alkyl group, NR₄ where R₄ includes two carbonyls as part of a phthalimide compound formed with R₁ or R₂, CH₂, CH, and C, with the caveat that, except in the case where A contains two identical CH and C moieties positioned adjacent one another to form an alkene or alkyne, the chemical moieties in A are each different from one another, and

wherein at least one of R₁ or R₂ is substituted with a compound having the chemical formula:

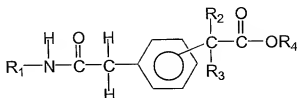


where n is zero to five,

where R₅ and R₆ are selected from the group consisting of hydrogen, halogen, substituted or unsubstituted C₁₋₁₂ alkyl groups, carboxylic acid and ester, substituted or unsubstituted aromatic or heteroaromatic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₅ and R₆, and

where R₇ is a hydrogen, halogen, salt cation, metal, or substituted or unsubstituted C₁₋₆ alkyl group; and

a compound having the formula:



where R₁ is selected from the group consisting of optionally substituted phenyl, adamantyl, naphthyl, and indanyl, R_{2,3} are alkyl moieties of a C₃₋₆ alkyl ring connecting R₂ and R₃, and R₄ is a hydrogen, a monovalent salt cation, or a C₁₋₃ lower alkyl.

5 15. The method of Claim 14, wherein the allosteric effector compound is administered at a dose of 100-300 mg/kg.

 16. The method of Claim 13, wherein the oxygenation of the tumor is measured quantitatively.

10 17. The method of Claim 13, wherein the allosteric effector compound is 2-[4-(((3,5-dimethylanilino)carbonyl)methyl)phenoxy]-2-methylpropionic acid, or a physiologically acceptable salt thereof.

15 18. The method of Claim 17, wherein the allosteric effector compound is administered at a dose of 100-300 mg/kg.

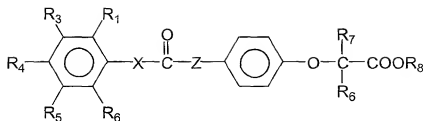
 19. The method of Claim 17, wherein the allosteric effector compound is administered at a dose of 200 mg/kg.

20 20. A method for determining an optimal time for the initiation of radiation therapy, comprising

- a) administering an effective amount of an allosteric effector compound capable of decreasing hemoglobin binding affinity for oxygen;
- 25 b) measuring the blood oxygen level dependent signal ratio; and
- c) determining the time required for a maximum increase in the blood oxygen level dependent signal ratio, whereby the optimal time for initiation of radiation therapy is determined.

30 21. The method of Claim 20, wherein the allosteric effector compound is selected from the group consisting of:

 a compound having the formula:

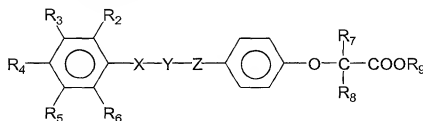


where R_{1-5} may be hydrogen, halogen, or a substituted or unsubstituted C_{1-3} alkyl group and may be the same or different,

R_{6-7} may each be hydrogen or methyl and may be the same or different, and

R_8 may be hydrogen, a substituted or unsubstituted C_{1-3} alkyl group, or a salt cation, and
X and Z are CH_2 , NH , or O ;

a compound having the formula:



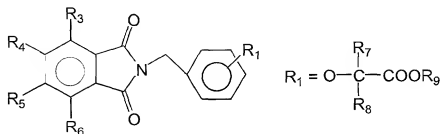
where X and Z may each be CH_2 , CO , NH or O , and Y may be CO or NH , which the caveat that X, Y, and Z must all be different from each other, and

R_{2-6} can be the hydrogen, halogen, substituted or unsubstituted C_{1-3} alkyl groups, and may be the same or different,

$R_{7,8}$ can be hydrogens, methyls, ethyls, or alkyl groups in a ring connecting the two, and

R_9 can be a hydrogen, lower alkyl, or salt cation;

a compound having the formula:

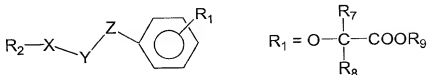


where R_{3-6} can be the hydrogen, halogen, substituted or unsubstituted C_{1-3} alkyl group, or a C_{1-3} ether or ester, and these moieties may be the same or different, or alkyl moieties of an aromatic or aliphatic ring incorporating two of the R_{3-6} ,

R_1 can be connected to any position on the phenyl ring, and

sites $R_{7,8}$ can be hydrogen, halogen, methyl, ethyl, and these moieties may be the same or different, or alkyl groups in a ring connecting the two, and

R₉ can be a hydrogen, halogen, C₁₋₃ lower alkyl, or salt cation;
a compound having the formula:



where R₁ can be connected to any position on the phenyl ring, and
sites R₇₋₈ can be hydrogen, halogen, methyl, ethyl, and these moieties may be the same or
different, or alkyl groups in a ring connecting the two, and

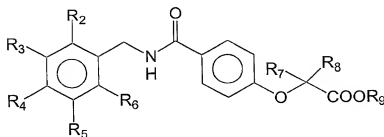
R₂ is defined as a substituted or unsubstituted aromatic compound, a substituted or
unsubstituted alkyl ring compound, or a substituted or unsubstituted phthalimide compound,

X is a carboxyl,

Y is a nitrogen,

and R₂ completes the phthalimide compound by being bonded to both X and Y; and
where X, Y, and Z, may either be CH₂, NH, O, or N, with the caveat that each are different from
the other;

a compound having the formula:

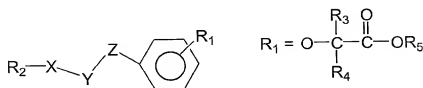


where R₂, R₃, R₄, R₅, and R₆ may be hydrogen, halogen, or alkyl groups and may be the
same or different,

R₇ and R₈ may be hydrogen or methyl groups and may be the same or different, and

where the R₉ moiety is hydrogen or a salt cation;

a compound having the formula:



where R₂ is a substituted or unsubstituted aromatic compound, or a substituted or
unsubstituted alkyl ring compound, or a substituted or unsubstituted phthalimide compound that
incorporates X and Y,

X is a carbonyl,

Y is a nitrogen, and

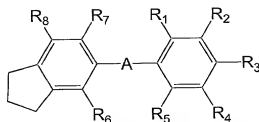
R₂ completes the phthalimide compound by being bonded to both X and Y, and where X, Y, and Z are CH₂, NH, S, SO₂, CO, O or N with the caveat that X, Y, and Z are each different from one another, and

where R₁ can be connected to any position on the phenyl ring, and

R₃ and R₄ are hydrogen, halogen, methyl, ethyl, propyl, isopropyl, neopentyl, butyl, or substituted or unsubstituted aryl groups and these moieties may be the same or different, or alkyl moieties as part of an aliphatic ring connecting R₃ and R₄, and

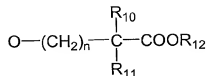
R₅ is a hydrogen, halogen, C₁₋₃ lower alkyl, or a salt cation;

a compound having the formula:



where A is a chemical bridge which includes two to four chemical moieties bonded together,

the chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₉ where R₉ is a C₁₋₆ alkyl group, CH₂, CH, and C, with the proviso that, except in the case where A contains two identical CH and C moieties positioned adjacent one another to form an alkene or alkyne, the chemical moieties in A are each different from one another, and at least one of R₁₋₅ is substituted with a compound having the chemical formula:



where n is zero to five,

where R₁₀ and R₁₁ are selected from the group consisting of hydrogen, halogen, C₁₋₁₂ alkyl groups, carboxylic acids and esters, aromatic or heteroatomic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₁₀ and R₁₁, and where R₁₂ is a hydrogen, halogen, salt cation, metal, or C₁₋₆ alkyl group, and wherein a remainder of the R₁₋₅ moieties and the R₆₋₈ moieties are selected from the group consisting of hydrogen, halogen, C₁₋₆ alkyl groups, C₁₋₆ ether or esters, aromatics and heteroaromatics, and alkyl moieties of an aliphatic ring connecting two sites on a phenyl group;

a compound having the formula:



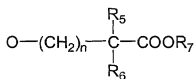
where R_1 and R_2 each are a substituted or unsubstituted aromatic or heteroaromatic compounds, or a substituted or unsubstituted alkyl or heteroalkyl ring compound, or a substituted or unsubstituted phthalimide compound, and

where R_1 and R_2 may be the same or different,

where A is a chemical bridge which includes three chemical moieties bonded together between R_1 and R_2 ,

wherein the chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₃ where R_3 is C₁₋₆ alkyl group, NR₄ where R_4 includes two carbonyls as part of a phthalimide compound formed with R_1 or R_2 , CH₂, CH, and C, and

where at least one of R_1 and R_2 is substituted with a compounds having the chemical formula:



where n is zero to five, where R_5 and R_6 are selected from the group consisting of hydrogen, halogen, substituted or unsubstituted C₁₋₁₂ alkyl groups, carboxylic acid and ester groups, substituted or unsubstituted aromatic or heteroaromatic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R_5 and R_6 , and

where R_7 is a hydrogen, halogen, salt cation, metal, or substituted or unsubstituted C₁₋₆ alkyl group;

a compound having the formula:



where R_1 and R_2 each are a substituted or unsubstituted aromatic or heteroaromatic compound, or substituted or unsubstituted alkyl or heteroalkyl ring compound, or a substituted or unsubstituted phthalimide compound, and

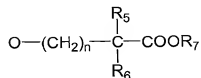
where R_1 and R_2 may be the same or different,

where A is a chemical bridge which includes two to four chemical moieties bonded together between R_1 and R_2 ,

wherein said chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₃ where R_3 is a C₁₋₆ alkyl group, NR₄ where R_4 includes two carbonyls as part of a phthalimide compound formed with R_1 or R_2 , CH₂, CH, and C, with the caveat that, except in the

case where A contains two identical CH and C moieties positioned adjacent one another to form an alkene or alkyne, the chemical moieties in A are each different from one another, and

wherein at least one of R₁ or R₂ is substituted with a compound having the chemical formula:

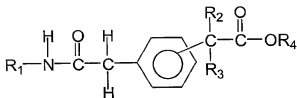


where n is zero to five,

where R₅ and R₆ are selected from the group consisting of hydrogen, halogen, substituted or unsubstituted C₁₋₁₂ alkyl groups, carboxylic acid and ester, substituted or unsubstituted aromatic or heteroaromatic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₅ and R₆, and

where R₇ is a hydrogen, halogen, salt cation, metal, or substituted or unsubstituted C₁₋₆ alkyl group; and

a compound having the formula:



where R₁ is selected from the group consisting of optionally substituted phenyl, adamantyl, naphthyl, and indanyl, R₂₋₃ are alkyl moieties of a C₃₋₆ alkyl ring connecting R₂ and R₃, and R₄ is a hydrogen, a monovalent salt cation, or a C₁₋₃ lower alkyl.

22. The method of Claim 20, wherein the allosteric effector compound is 2-[4-(((3,5-dimethylanilino)carbonyl)methyl)phenoxy]-2-methylpropionic acid, or a physiologically acceptable salt thereof.

23. A method of diagnosing an abnormal pathology, comprising

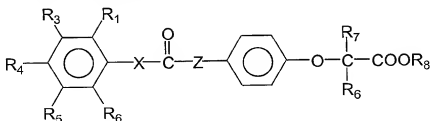
a) introducing an allosteric effector compound into a patient suspected of having the abnormal pathology;

b) performing a blood oxygen level-dependent magnetic resonance imaging scan of the patient, and

c) detecting an increase in blood oxygen level-dependent magnetic resonance imaging signal; whereby an abnormal pathology may be diagnosed.

24. The method of Claim 23, wherein the allosteric effector compound is selected from the group consisting of:

a compound having the formula:

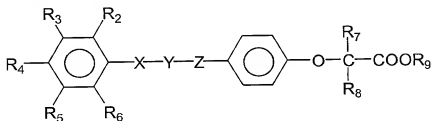


where R₁₋₅ may be hydrogen, halogen, or a substituted or unsubstituted C₁₋₃ alkyl group and may be the same or different,

R₆₋₇ may each be hydrogen or methyl and may be the same or different, and

R₈ may be hydrogen, a substituted or unsubstituted C₁₋₃ alkyl group, or a salt cation, and X and Z are CH₂, NH, or O;

a compound having the formula:



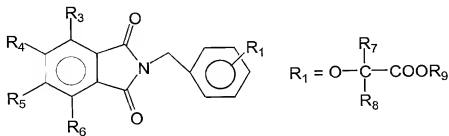
where X and Z may each be CH₂, CO, NH or O, and Y may be CO or NH, which the caveat that X, Y, and Z must all be different from each other, and

R₂₋₆ can be the hydrogen, halogen, substituted or unsubstituted C₁₋₃ alkyl groups, and may be the same or different,

R₇₋₈ can be hydrogens, methyls, ethyls, or alkyl groups in a ring connecting the two, and

R₉ can be a hydrogen, lower alkyl, or salt cation;

a compound having the formula:



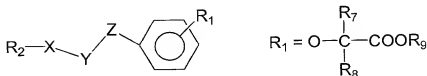
where R₃₋₆ can be the hydrogen, halogen, substituted or unsubstituted C₁₋₃ alkyl group, or a C₁₋₃ ether or ester, and these moieties may be the same or different, or alkyl moieties of an aromatic or aliphatic ring incorporating two of the R₃₋₆,

R₁ can be connected to any position on the phenyl ring, and

sites R_{7,8} can be hydrogen, halogen, methyl, ethyl, and these moieties may be the same or different, or alkyl groups in a ring connecting the two, and

R₉ can be a hydrogen, halogen, C₁₋₃ lower alkyl, or salt cation;

a compound having the formula:



where R₁ can be connected to any position on the phenyl ring, and

sites R₇₋₈ can be hydrogen, halogen, methyl, ethyl, and these moieties may be the same or different, or alkyl groups in a ring connecting the two, and

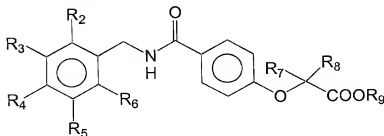
R₂ is defined as a substituted or unsubstituted aromatic compound, a substituted or unsubstituted alkyl ring compound, or a substituted or unsubstituted phthalimide compound,

X is a carboxyl,

Y is a nitrogen,

and R₂ completes the phthalimide compound by being bonded to both X and Y; and where X, Y, and Z, may either be CH₂, NH, O, or N, with the caveat that each are different from the other;

a compound having the formula:

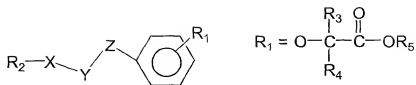


where R₂, R₃, R₄, R₅, and R₆ may be hydrogen, halogen, or alkyl groups and may be the same or different,

R₇ and R₈ may be hydrogen or methyl groups and may be the same or different, and

where the R₉ moiety is hydrogen or a salt cation;

a compound having the formula:



where R₂ is a substituted or unsubstituted aromatic compound, or a substituted or unsubstituted alkyl ring compound, or a substituted or unsubstituted phthalimide compound that incorporates X and Y,

X is a carbonyl,

Y is a nitrogen, and

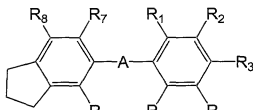
R₂ completes the phthalimide compound by being bonded to both X and Y, and where X, Y, and Z are CH₂, NH, S, SO₂, CO, O or N with the caveat that X, Y, and Z are each different from one another, and

where R₁ can be connected to any position on the phenyl ring, and

R₃ and R₄ are hydrogen, halogen, methyl, ethyl, propyl, isopropyl, neopentyl, butyl, or substituted or unsubstituted aryl groups and these moieties may be the same or different, or alkyl moieties as part of an aliphatic ring connecting R₃ and R₄, and

R₅ is a hydrogen, halogen, C₁₋₃ lower alkyl, or a salt cation;

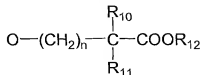
a compound having the formula:



where A is a chemical bridge which includes two to four chemical moieties bonded together,

the chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₉ where R₉ is a C₁₋₆ alkyl group, CH₂, CH, and C, with the proviso that, except in the case where A contains two identical CH and C moieties positioned adjacent one another to form an alkene or alkyne, the chemical moieties in A are each different from one another, and

at least one of R₁₋₅ is substituted with a compound having the chemical formula:



where n is zero to five,

where R₁₀ and R₁₁ are selected from the group consisting of hydrogen, halogen, C₁₋₁₂ alkyl groups, carboxylic acids and esters, aromatic or heteroatomic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₁₀ and R₁₁, and where R₁₂ is a hydrogen, halogen, salt cation, metal, or C₁₋₆ alkyl group, and wherein a remainder of the R₁₋₅ moieties and the R₆₋₈ moieties are selected from the group consisting of hydrogen, halogen, C₁₋₆ alkyl groups, C₁₋₆ ether or esters, aromatics and heteroaromatics, and alkyl moieties of an aliphatic ring connecting two sites on a phenyl group; a compound having the formula:



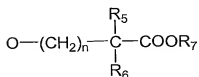
where R₁ and R₂ each are a substituted or unsubstituted aromatic or heteroaromatic compounds, or a substituted or unsubstituted alkyl or heteroalkyl ring compound, or a substituted or unsubstituted phthalimide compound, and

where R₁ and R₂ may be the same or different,

where A is a chemical bridge which includes three chemical moieties bonded together between R₁ and R₂,

wherein the chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₃ where R₃ is C₁₋₆ alkyl group, NR₄ where R₄ includes two carbonyls as part of a phthalimide compound formed with R₁ or R₂, CH₂, CH, and C, and

where at least one of R₁ and R₂ is substituted with a compounds having the chemical formula:



where n is zero to five, where R₅ and R₆ are selected from the group consisting of hydrogen, halogen, substituted or unsubstituted C₁₋₁₂ alkyl groups, carboxylic acid and ester groups, substituted or unsubstituted aromatic or heteroaromatic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₅ and R₆, and

where R₇ is a hydrogen, halogen, salt cation, metal, or substituted or unsubstituted C₁₋₆ alkyl group;

a compound having the formula:



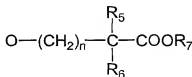
where R₁ and R₂ each are a substituted or unsubstituted aromatic or heteroaromatic compound, or substituted or unsubstituted alkyl or heteroalkyl ring compound, or a substituted or unsubstituted phthalimide compound, and

where R₁ and R₂ may be the same or different,

where A is a chemical bridge which includes two to four chemical moieties bonded together between R₁ and R₂,

wherein said chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₃ where R₃ is a C₁₋₆ alkyl group, NR₄ where R₄ includes two carbonyls as part of a phthalimide compound formed with R₁ or R₂, CH₂, CH, and C, with the caveat that, except in the case where A contains two identical CH and C moieties positioned adjacent one another to form an alkene or alkyne, the chemical moieties in A are each different from one another, and

wherein at least one of R₁ or R₂ is substituted with a compound having the chemical formula:

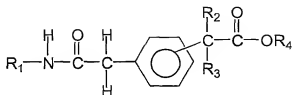


where n is zero to five,

where R₅ and R₆ are selected from the group consisting of hydrogen, halogen, substituted or unsubstituted C₁₋₁₂ alkyl groups, carboxylic acid and ester, substituted or unsubstituted aromatic or heteroaromatic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₅ and R₆, and

where R₇ is a hydrogen, halogen, salt cation, metal, or substituted or unsubstituted C₁₋₆ alkyl group; and

a compound having the formula:



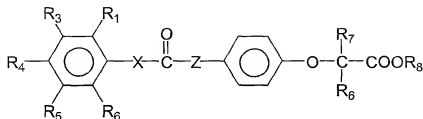
where R₁ is selected from the group consisting of optionally substituted phenyl, adamantyl, naphthyl, and indanyl, R₂₋₃ are alkyl moieties of a C₃₋₆ alkyl ring connecting R₂ and R₃, and R₄ is a hydrogen, a monovalent salt cation, or a C₁₋₃ lower alkyl.

25. The method of Claim 23, wherein the allosteric effector compound is 2-[4-(((3,5-dimethylanilino)carbonyl)methyl)phenoxy]-2-methylpropionic acid, or a physiologically acceptable salt thereof.

26. A method of imaging glioblastoma multiforme, comprising
a) administering an effective amount of an allosteric effector compound capable of decreasing hemoglobin binding affinity for oxygen; and
b) performing a blood oxygen level-dependent magnetic resonance imaging scan, whereby glioblastoma multiforme may be imaged.

27. The method of Claim 26, wherein the allosteric effector compound is selected from the group consisting of:

a compound having the formula:

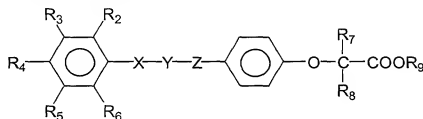


where R₁₋₅ may be hydrogen, halogen, or a substituted or unsubstituted C₁₋₃ alkyl group and may be the same or different,

R₆₋₇ may each be hydrogen or methyl and may be the same or different, and

R₈ may be hydrogen, a substituted or unsubstituted C₁₋₃ alkyl group, or a salt cation, and X and Z are CH₂, NH, or O;

a compound having the formula:



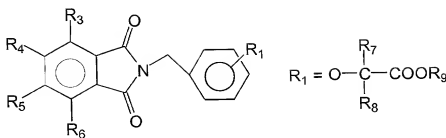
where X and Z may each be CH₂, CO, NH or O, and Y may be CO or NH, which the caveat that X, Y, and Z must all be different from each other, and

R₂₋₆ can be the hydrogen, halogen, substituted or unsubstituted C₁₋₃ alkyl groups, and may be the same or different,

R_{7,8} can be hydrogens, methyls, ethyls, or alkyl groups in a ring connecting the two, and

R₉ can be a hydrogen, lower alkyl, or salt cation;

a compound having the formula:



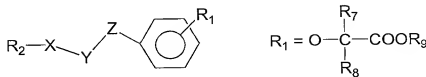
where R_{3-6} can be the hydrogen, halogen, substituted or unsubstituted C_{1-3} alkyl group, or a C_{1-3} ether or ester, and these moieties may be the same or different, or alkyl moieties of an aromatic or aliphatic ring incorporating two of the R_{3-6} ,

R_1 can be connected to any position on the phenyl ring, and

sites R_{7-8} can be hydrogen, halogen, methyl, ethyl, and these moieties may be the same or different, or alkyl groups in a ring connecting the two, and

R_9 can be a hydrogen, halogen, C_{1-3} lower alkyl, or salt cation;

a compound having the formula:



where R_1 can be connected to any position on the phenyl ring, and

sites R_{7-8} can be hydrogen, halogen, methyl, ethyl, and these moieties may be the same or different, or alkyl groups in a ring connecting the two, and

R_2 is defined as a substituted or unsubstituted aromatic compound, a substituted or unsubstituted alkyl ring compound, or a substituted or unsubstituted phthalimide compound,

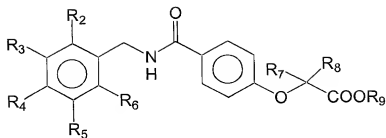
X is a carboxyl,

Y is a nitrogen,

and R_2 completes the phthalimide compound by being bonded to both X and Y; and

where X, Y, and Z, may either be CH_2 , NH, O, or N, with the caveat that each are different from the other;

a compound having the formula:

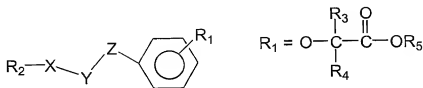


where R_2 , R_3 , R_4 , R_5 , and R_6 may be hydrogen, halogen, or alkyl groups and may be the same or different,

R_7 and R_8 may be hydrogen or methyl groups and may be the same or different, and

where the R_9 moiety is hydrogen or a salt cation;

a compound having the formula:



where R_2 is a substituted or unsubstituted aromatic compound, or a substituted or unsubstituted alkyl ring compound, or a substituted or unsubstituted phthalimide compound that incorporates X and Y,

X is a carbonyl,

Y is a nitrogen, and

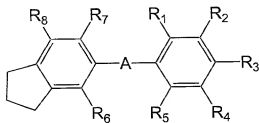
R_2 completes the phthalimide compound by being bonded to both X and Y, and where X, Y, and Z are CH_2 , NH, S, SO_2 , CO, O or N with the caveat that X, Y, and Z are each different from one another, and

where R_1 can be connected to any position on the phenyl ring, and

R_3 and R_4 are hydrogen, halogen, methyl, ethyl, propyl, isopropyl, neopentyl, butyl, or substituted or unsubstituted aryl groups and these moieties may be the same or different, or alkyl moieties as part of an aliphatic ring connecting R_3 and R_4 , and

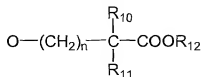
R_5 is a hydrogen, halogen, C_{1-3} lower alkyl, or a salt cation;

a compound having the formula:



where A is a chemical bridge which includes two to four chemical moieties bonded together,

the chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₉ where R₉ is a C₁₋₆ alkyl group, CH₂, CH, and C, with the proviso that, except in the case where A contains two identical CH and C moieties positioned adjacent one another to form an alkene or alkyne, the chemical moieties in A are each different from one another, and at least one of R₁₋₅ is substituted with a compound having the chemical formula:



where n is zero to five,

where R₁₀ and R₁₁ are selected from the group consisting of hydrogen, halogen, C₁₋₁₂ alkyl groups, carboxylic acids and esters, aromatic or heteroatomic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₁₀ and R₁₁, and where R₁₂ is a hydrogen, halogen, salt cation, metal, or C₁₋₆ alkyl group, and wherein a remainder of the R₁₋₅ moieties and the R₆₋₈ moieties are selected from the group consisting of hydrogen, halogen, C₁₋₆ alkyl groups, C₁₋₆ ether or esters, aromatics and heteroaromatics, and alkyl moieties of an aliphatic ring connecting two sites on a phenyl group; a compound having the formula:



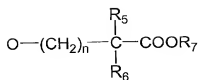
where R₁ and R₂ each are a substituted or unsubstituted aromatic or heteroaromatic compounds, or a substituted or unsubstituted alkyl or heteroalkyl ring compound, or a substituted or unsubstituted phthalimide compound, and

where R₁ and R₂ may be the same or different,

where A is a chemical bridge which includes three chemical moieties bonded together between R₁ and R₂,

wherein the chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₃ where R₃ is C₁₋₆ alkyl group, NR₄ where R₄ includes two carbonyls as part of a phthalimide compound formed with R₁ or R₂, CH₂, CH, and C, and

where at least one of R₁ and R₂ is substituted with a compounds having the chemical formula:



where n is zero to five, where R₅ and R₆ are selected from the group consisting of hydrogen, halogen, substituted or unsubstituted C₁₋₁₂ alkyl groups, carboxylic acid and ester groups, substituted or unsubstituted aromatic or heteroaromatic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₅ and R₆, and where R₇ is a hydrogen, halogen, salt cation, metal, or substituted or unsubstituted C₁₋₆ alkyl group;

a compound having the formula:



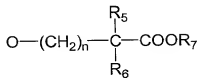
where R₁ and R₂ each are a substituted or unsubstituted aromatic or heteroaromatic compound, or substituted or unsubstituted alkyl or heteroalkyl ring compound, or a substituted or unsubstituted phthalimide compound, and

where R₁ and R₂ may be the same or different,

where A is a chemical bridge which includes two to four chemical moieties bonded together between R₁ and R₂,

wherein said chemical moieties in A are selected from the group consisting of CO, O, S, SO₂, NH, NR₃ where R₃ is a C₁₋₆ alkyl group, NR₄ where R₄ includes two carbonyls as part of a phthalimide compound formed with R₁ or R₂, CH₂, CH, and C, with the caveat that, except in the case where A contains two identical CH and C moieties positioned adjacent one another to form an alkene or alkyne, the chemical moieties in A are each different from one another, and

wherein at least one of R₁ or R₂ is substituted with a compound having the chemical formula:

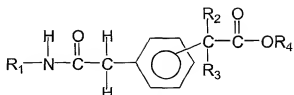


where n is zero to five,

where R₅ and R₆ are selected from the group consisting of hydrogen, halogen, substituted or unsubstituted C₁₋₁₂ alkyl groups, carboxylic acid and ester, substituted or unsubstituted aromatic or heteroaromatic groups, and these moieties may be the same or different, or alkyl moieties of part of an aliphatic ring connecting R₅ and R₆, and

where R₇ is a hydrogen, halogen, salt cation, metal, or substituted or unsubstituted C₁₋₆ alkyl group; and

a compound having the formula:



where R_1 is selected from the group consisting of optionally substituted phenyl, adamantyl, naphthyl, and indanyl, R_{2-3} are alkyl moieties of a C_{3-6} alkyl ring connecting R_2 and R_3 , and R_4 is a hydrogen, a monovalent salt cation, or a C_{1-3} lower alkyl.

28. The method of Claim 26, wherein the allosteric effector compound is 2-[4-(((3,5-dimethylanilino)carbonyl)methyl)phenoxy]-2-methylpropionic acid, or a physiologically acceptable salt thereof.

29. The method of Claim 26, further comprising administering a chemotherapy agent.

30. The method of Claim 29, wherein the chemotherapy agent is BCNU.